IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant	:	Jones, et al.	Group Art Unit: 2857
Appl. No.	:	09/810,932	
Filed	:	March 16, 2001	
For	:	**METHOD AND APPARATUS FOR TRANSMISSION LINE ANALYSIS**	
Examiner	:	Jeffrey R. West	

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December 15, 2003
(Date)

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APPEAL BRIEF

I. REAL PARTY IN INTEREST

The subject application is owned by and the real party in interest is the assignee of record, Mindspeed Technologies, Inc. (hereinafter Appellant).

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-13, 21-30, 40-54, and 60-70 are pending in the above-reference application. In an action mailed June 16, 2003 the Examiner submitted a final rejection to the Appellant of all pending claims, namely, Claims 1-13, 21-30, 40-54, and 60-70.

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection of June 16, 2003.

V. SUMMARY OF INVENTION

In general, communication systems transmit data over a channel, such as twisted copper pair or other medium, to achieve data communication between remote locations. To successfully achieve high speed data communication, the channel must meet certain requirements. One such requirement is that the channel be free of line anomalies, which may comprise impedance mismatches, physical breaks in the channel, kinks, or unwanted connections or taps into the channel.

Thus, when provisioning a communication system, such as a DLS system, it is beneficial to first determine if the channel will support communication. In addition, if a channel is impaired and unable to support data communication, it is beneficial to quickly and accurately locate the line anomalies so that service technicians may be dispatched to quickly find and fix the problem.

Prior art systems and methods pursued one of two prior art paths when attempting to provision a line. One prior art path utilized stand alone test equipment configured with complex line probe hardware and software. A skilled technician connected the stand alone test equipment to the line in questions and performed testing. The test equipment is expensive and connection and use of the test equipment is a time consuming and thus expensive, process.

The other prior art path utilizes a simple high power pulse line probe process that can be built into a communication device. While such a method and apparatus could be included in a communication device, it suffered from the disadvantage of being imprecise and of limited use

for long distance lines. More significantly, use of a high power pulse creates electro-magnetic interference that couples into and disrupts operation of adjacent channels, such as other channels in a bundle of channels.

In contrast to the prior art, the claimed method and apparatus departs from these two prior paths and the conventional thinking in the art by incorporating the complex line probe process into a communication device. Herebefore, this was not thought possible. This provides numerous advantages over the prior art such as an ability to line probe any line at any time without having to purchase an expensive piece of test equipment and without having to physically disconnect the modem from the line and connect the test equipment. Moreover, if a repair to the line is made, then using the already connected modem, additional testing may easily and quickly occur. In addition, communication device hardware is configured to implement the complex line probe process but the cost, size and complexity of the communication device does not increase.

The inventors, who work at Appellant Mindspeed Technologies, successfully invented, developed, tested, and brought this product to market. Currently, it is offered under a communication test package that the undersigned attorney believes is identified by the marketing name LoopWizard. It is the understanding of the undersigned Appellant attorney, that LoopWizard and the claimed invention are responsible for provisioning an enormous number of communication channels at a cost, speed, and accuracy that was simply not possible before this invention.

In one example embodiment, such as that covered by claim 1, the communication device and its associated method of operation comprises a modem configured to connect to a

communication channel. The modem generates and transmits a select sequence comprising low powered select sequence signal over the line. By using a particular sequence signal that has good correlation properties in the line probe process, interference and crosstalk drawbacks of the prior art are overcome and additional benefits are realized.

If the sequence encounters a line anomaly (impedance mismatch) as it progresses through the channel, it creates a reflection which travels back in the direction of the modem and is received by the modem. Upon receipt, the reflection is correlated with the originally transmitted sequence signal and the resulting correlated signal analyzed for points of correlation which would appear as peaks. A point of correlation represents a line anomaly and may be generated when the sequence signal encounters an impedance mismatch. In one embodiment, correlation is a mathematical process where two signals are multiplied and summed on a point-by-point basis.

If a point of correlation is detected, then the time period between the point of correlation and the transmission of the sequence signal is utilized, in conjunction with the rate of propagation of the signal through the channel, to determine the distance of the line anomaly from the modem. As a result, the line may be quickly analyzed while the communication device is connected to the line and if a problem is found, a service technician dispatched to the precise location identified by the line probe capable communication device.

VI. ISSUES

Appellant requests review of the Examiner's final rejection of Claims 1-13, 21-30, 40-54, and 60-70. In particular, Appellants request review of Examiner's rejection of:

1. Claims 1-5, 7, 8, 11-12, 26, 27, 40, 41, 43, 60-62, 64-67, 69, and 70 which are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,298,118 to Liggett in view of U.S. Patent No. 6,534,996 to Amrany et al. and U.S. Patent No. 5,600,248 to Westrom et al.

2. Claim 10 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent Application Publication No. 2002/0114383-A1 to Belge et al.

3. Claims 6, 13, 30, and 63 which are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom et al. and further in view of U.S. Patent No. 5,062,703 to Wong et al.

4. Claim 9 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 4,963,020 to Luthra et al.

5. Claims 21, 22, 25, and 29 which are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom, and further in view of U.S. Patent No. 4,597,183 to Broding.

6. Claim 23 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom and Broding, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

7. Claim 24 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, and Broding and further in view of Wong et al.

8. Claim 28 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 4,041,381 to Hwa.

9. Claims 42 and 44 which are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westom, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

10. Claims 45, 46, 48 and 49 which are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,075,628 to Fisher et al.; and

11. Claim 47 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, and Fisher and further in view of U.S. Patent No. 6,417,672 to Chong.

12. Claims 50, 51, and 53 which are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,144,250 to Little and U.S. Patent No. 5,523,758 to Harmuth.

13. Claim 52 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,122,652 to Jin et al.

14. Claim 54 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,292,539 to Eichen et al.

15. Claim 68 which is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,122,652 to Jin et al.

VII. GROUPING OF CLAIMS

Appellant submits that the grouping of claims as defined by the Examiner's rejection is complex and is not the grouping that would be independently selected by the Appellant. The rejected claims are grouped in accordance with rejections set forth by the Examiner, namely rejected **Claim Groups 1-15**. As noted below, Appellant asserts that within some of the Claim Groups, some of the claims stand or fall independent of the other rejected claims in the Claim Group.

To aid the Board in the association of Claims, Appellant submits that the claims may be associated by subject matter in the following manner, and the Appellant's association of claims follows this structure. This claim association is provided only for purposes of understanding and

Appellant does not submit that the claims should by addressed by the Examiner, nor the Board in this manner.

Association 1:

Claims 7-13, Claims 45-49, and Claims 60-64.

Association 2:

Claims 21- 25, Claims 26- 30, Claims 50-54, and Claims 65-70.

Association 3:

Claims 1-6, and Claims 40-44.

The rejected claims are grouped in accordance with the following grouping as established by the Examiner:

Rejected Claim Group 1:

Claims 1-5, 7, 8, 11-12, 26, 27, 40, 41, 43, 60-62, 64-67, 69, and 70. Appellant asserts that Claims 7, 8, 11-12, 60-62 and 64 (Association 1) stand or fall independent of the other claims in this group. Appellant asserts that Claims 26-27, 65, 67, 69 and 67 (Association 2) stand or fall independent of the other claims in this group. Appellant asserts that Claims 1-5, 40, 41, and 43 (Association 3) stand or fall independent of the other claims in this group.

Rejected Claim Group 2:

Claim 10.

Rejected Claim Group 3:

Claims 6, 13, 30, and 63. Appellant asserts that Claims 13 and 63 (Association 1) stand and fall independent of the other claims in this group. Appellant asserts that Claim 30 (Association 2) stands or falls independent of the other claims in this group. Appellant asserts that Claim 6 (Association 3) stands or falls independent of the other claims in this group.

Rejected Claim Group 4:

Claim 9.

Rejected Claim Group 5:

Claims 21, 22, 25, and 29.

Rejected Claim Group 6:

Claim 23.

Rejected Claim Group 7:

Claim 24.

Rejected Claim Group 8:

Claim 28.

Rejected Claim Group 9:

Claims 42 and 44.

Rejected Claim Group 10:

Claims 45, 46, 48 and 49.

Rejected Claim Group 11:

Claim 47.

Rejected Claim Group 12:

Claims 50, 51, and 53.

Rejected Claim Group 13:

Claim 52.

Rejected Claim Group 14:

Claim 54.

Rejected Claim Group 15:

Claim 68.

VIII. ARGUMENT

A. Rejected Claim Group 1

The Examiner rejected Claims 1-5, 7, 8, 11-12, 26, 27, 40, 41, 43, 60-62, 64-67, 69, and 70 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,298,118 to Liggett in view of U.S. Patent No. 6,534,996 to Amrany et al. and U.S. Patent No. 5,600,248 to Westrom et al.

1. First Claim Association

Appellant asserts that Claims 7, 8, 11-12, 60-62 and 64 (Association 1) stand or fall independent of the other claims in this group.

The Examiner's Assertions

The Examiner asserts that Liggett teaches a method for testing a twisted pair communication channel using time domain reflectometry (column 4, lines 11-16) comprising a pseudo-random code processor that generates and decodes pseudo-random coded signals to be transmitted on, and received from, the twisted pair conductor channel (column 4, lines 64-67), such as an asymmetric digital subscriber line (column 3, lines 48-49) connected to a computer modem for communication on the channel (column 3, lines 33-34), wherein the signals are sent at a low energy (i.e. power) level to lower the possibility of cross-talk occurring across the various twisted line channels (column 5, lines 9-12). Liggett also teaches that the transmittal

signals (i.e. test signals) are generated using a code generator that reads from a shift register memory to define a specified maximal length sequence code, with corresponding taps, (column 5, lines 13-18 and 25-30) which is transmitted over the communication channel and reflected back, in response to the transmission, to the receiver for sending to a cross-correlator (column 5, lines 18-24), inherently with processing code, which correlates the original maximal length sequence signal with the reflected signal (column 5, lines 51-55). Liggett also teaches that a peak detector detects a plurality of peaks (i.e. signal components) of the reflected signal including peaks in response to an unwanted near-end echo pulse at the start of the signal, caused by reflection at the line interface, and a bridged tap in the communication channel (column 7, lines 30-37).

Examiner further asserts that Liggett, however, teaches implementing the method using a remote device, rather than using an existing modem, and does not teach a method for removing the unwanted near-end echo or a method for measuring the location of the fault in the communication line.

Amrany teaches a system and method for phone line characterization by time domain reflectometry comprising a method for transmitting and receiving reflection signals sent using components and processor code existing in a DSL modem (i.e. processor components, transmitting components, receiving components, and signal generating components and that are configured to operate as part of the DSL during normal communication) connected to a communication channel (column 1, lines 51-67, column 6, lines 19-29, and Figure 5). Amrany teaches that the reflected signal is analyzed to determine the type and location of impedance disruptions (column 3, lines 20-41) of the twisted pair transmission line (column 3, lines 48-50).

Amrany also teaches including an echo canceller (column 4, line 63), a finite impulse response filter (columns 5, lines 4-6), and a de-convolution means, with processing functions similar to that of the correlation means of Liggett, to detect phase differences and corresponding coefficients in determining the line abnormalities (column 9, lines 9-57). Amrany also teaches that the transmitted signal is a highly sampled plurality of pulses (column 8, lines 33-53).

Westrom teaches a fault distance locator for underground cable circuits comprising generating a pulse into a communication channel to obtain a reference pulse signal (i.e. template), during a setup operation, (column 4, lines 62-65) and, during actual operating, receiving a plurality of reflected pulses (column 8, lines 41-51) including an unwanted near-end echo pulse, caused by the reflection at the line interface, which is removed by subtracting the obtained reference/template pulse data from the actual received pulse data set (column 9, lines 9-21). Westrom then teaches determining a time interval between the beginning of the pulse injection and the subsequent peak/pulse (i.e. point of correlation) indicative of a line abnormality and then multiplying the time interval times the propagation speed to determine the distance to the location of the fault (column 9, lines 56-64). Westrom also teaches a computer controller comprising a microprocessor and a corresponding memory for storing a program, executed by the microprocessor, that initiates the generation of the input pulses, calculates the time intervals to the fault (column 8, lines 14-21), and also connects to a modem to report monitoring information (column 6, lines 40-45).

It would have been obvious to one having ordinary skill in the art to modify the invention to Liggett to include using an existing modem for carrying out the time-domain reflectometry method, as taught by Amrany, because, as suggested by Amrany, the combination would have

reduced costs by using existing circuitry rather than requiring separate circuitry and eliminated the need for test equipment that may introduce disturbance effects (column 1, lines 40-47 and column 6, lines 19-29).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett to include a method for removing the unwanted near-end echo and a method for measuring the location of the fault in the communication line, as taught by Westrom, since Liggett teaches that the near-end echo pulse is undesired and not used in measurements and Westrom provides a corresponding method to insure that the accuracy of the measurement is maintained by removing the unwanted pulse (i.e. the calculations will be based on full reflected pulses at the occurrence of a fault rather than the first extraneous pulse) and, as suggested by Westrom, the combination would have allowed quick repair or replacement of a transmission line fault by providing an exact location of the problem (column 1, lines 22-27).

Although the invention of Liggett and Westrom doesn't specifically disclose aligning the template signal and the correlated signal to determine a point of alignment, it is considered inherent that in order for the template signal to be subtracted from the correlated signal to correctly remove the near-end echo pulse, the signals must first be property aligned.

In response to the Appellant's arguments, the Examiner further asserts the Applicant argues that the "Westrom reference is directed to testing high-voltage underground power cables utilizing a high power pulse. The claims as amended are directed to a communication device capable of achieving data communication . . . Hence, one of ordinary skill in the art would be a designer of high-speed communication devices. As such, the Applicant asserts that the Westrom reference is improperly cited by the Examiner, since one of ordinary skill in the art for high-

speed data communication devices would not be aware of or familiar with high-voltage underground power line technology". The Examiner asserts that while the invention of Westrom is drawn to underground power cables, it is also more generally drawn to an overall method for performing time-domain reflectometry. Since the invention of Liggett is also concerned with a problem for performing time-domain reflectometry and further, since the invention of Westrom is included to teach processing details that could be applied in the invention of Liggett, the two inventions are properly combined.

Applicant then argues that the Westrom reference teaches away from the claimed combination "by suggesting use of a high power pulse generated by the high power pulse generator 28 shown in Figure 1. Use of a high power pulse is teaching directly opposite of the direction of the claimed invention, which utilizes a sequence of lower power pulses. Use of a high power pulse can significantly disrupt operation of adjacent lines and is limited in accuracy". As mentioned above, the invention of Westrom is not included to teach the type of pulse to be applied in the invention, but instead is included to teach processing details applicable in the invention of Liggett.

The Appellant's Assertion and Argument

General Background

As amended Claims 7, 8, 11-12, and 60-62 and 64 expressly incorporate the limitation that the method is performed within or by a communication device, such as for example, a

modem, or that the system comprises a communication device or modem. Claim 60 has been amended to require means for cross correlating. Appellant submits that the claims as amended overcome the prior art for the reasons provided below. Appellant has provided a Joint Declaration of Keith Jones and William Jones, both of whom are inventors and are of at least ordinary skill in the art, regarding their interpretation of the teachings of the primary cited references and their characterization of the claims, the inventive process, and the non-obviousness of the claimed invention to one of ordinary skill in the art.

The Declaration supports that there existed two paths or schools of thought in the prior art when dealing with line probing. The art cited by the Examiner reflects these two conventional paths, namely, 1) non-complex time domain reflectometry (TDR) (which does not use a correlatable sequence signal) which may occur, due to its simplicity, in a modem, and 2) complex sequence signal TDR in expensive stand alone test equipment. Based on the comments of the inventors in the Joint Declaration, these two paths are the accepted and conventional wisdom in the art.

In contrast, the claimed invention diverges from these conventional paths by combining the complex sequence signal TDR with convolution into a communication device. This is achieved utilizing components and functionality presently existing in communication devices without the need to add complex processors and signal generators. None of the cited references disclose a communication device having sequence signal time domain reflectometry capability as claimed in the Claims of the present application, nor would such a system or method be obvious to one of ordinary skill in the art based on a reading of the cited references.

Appellant notes that the fact, as supported by the Joint Declaration, that the inventors proceeded contrary to the accepted wisdom in the art is an indication of non-obviousness. As specified in Manual of Patent Examining Procedure § 2145(X)(D)(3), proceeding contrary to accepted wisdom is evidence of non-obviousness.

Failure to Consider Declaration is Legal Error

In the Office Action, the Examiner committed error by failing to take into consideration the declaration submitted by the Appellant. This is legal error as the Examiner must consider the evidence presented. Stratoflex, Inc. v. Aeroquip, 713 F.2d 1530, 1538 (Fed. Cir. 1983), In re Beatti, 974 F.2d 1309, 1313 (Fed. Cir. 1992). See also, Manual of Patent Examining Procedure §716.01(a). The Examiner's only acknowledgement of the declaration was in support of a position cited by and in favor of the Appellant. The Appellant has met their burden with the declaration and as such the burden has shifted to the Examiner. The Examiner, has not however, carried the burden because the Examiner has not submitted any evidence to support his position or rebut the Declaration. Because the Examiner refused to even consider the declaration, the Office Action is improper and as such, the rejections found therein should be withdrawn and the claims allowed.

No Suggestion to Combine

As cited in section 706.02(j) of the Manual of Patent Examining Procedure, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference

teachings. In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991). The teaching or suggestion to make the claimed combination must both be found in the prior art and not be based on the Appellant's disclosure. Appellant submits that the prior art does not contain such suggestions, but instead teaches away from such a combination. The fact that two or more references can contain individual parts of a claim does not make the claimed combination obvious. There must be some suggestion to combine. In particular, at Manual of Patent Examining Procedure at § 2143.01 clearly states that:

> Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In contrast to what is required by the rules, none one of the references cited by the Examiner contains a suggestion or motivation to combine the teachings of the references with the

other references to form the claimed invention. This is simply not present in the references cited by the Examiner, nor has the Examiner cited such passages in the cited prior art.

The Examiner also misinterprets what is necessary for a reference to contain a suggestion to combine. Within the Office Action, the Examiner often cites a passage within a reference for teaching a claim element and a passage within the reference generally indicating that this claim element is generally desirable. The Examiner then improperly asserts that this cited passages comprises a motivation or suggestion to combine this elements into the other prior art references.

Such an assertion is improper. These passages simply teach that the cited element is desirable in the system described in the prior art reference, but these passages do not rise to the level of motivating or suggesting a combination of this element with the other cited references. A broad statement that an element is a beneficial element does not equate to a motivation to combine that element with every other communication system.

References

The Examiner utilized the Liggett reference as a primary reference in the rejections of independent Claims 7 and 60. Liggett is directed, as clearly shown in Figures 3 and 4, to a stand alone piece of test equipment. Moreover, no suggestion is made within the Liggett reference to implement the disclosed system into a communication device. Absent such a suggestion to combine in the Liggett reference or the other references, the Liggett reference cannot be used in an obviousness rejection.

Furthermore, and as supported in the Declaration, the Liggett reference actually teaches away from the present invention by teaching complex multi-processor based sequence signal

TDR in a stand alone piece of test equipment. (Fig. 3, and column 4, line 46 (main processor 14); column 4, line 64 (code processor 14); column 6, line 8 (distortion processor 28); column 6, line 41 (baseline processor 32).) This path is a known line of conventional and accepted wisdom in the prior art.

The Examiner also cites the Westrom reference in the rejection of independent Claims 7 and 60. The Westrom reference is directed to testing high-voltage underground power cables utilizing a high power pulse. The claims as amended are however directed to a communication device capable of achieving data communication. Appellant asserts that one of ordinary skill in the art would be a designer of high-speed communication devices. As such, Appellant asserts that the Westrom reference is improperly cited by the Examiner, since one of ordinary skill in the art for high-speed data communication devices would not seek out art directed to high-voltage underground power line technology. This position is supported by the Declaration.

As further supported by the Declaration, the Westrom reference not only does not suggest the claimed combination, but in fact teaches away from the claimed combination by suggesting use of a high power pulse generated by the high power pulse generator 28 shown in Figure 1. Use of a high power pulse is teaching directly opposite to the direction of the claimed invention, which utilizes a sequence signal of lower power. Use of a high power pulse can significantly disrupt operation of adjacent lines and is limited in accuracy. Support for this statement is provided in the Declaration. An inventor reading the Westrom reference would be lead away from a system utilizing a low power sequence signal.

Although the Examiner submits that Westrom is being cited for processing details, it does not negate the fact that Westrom teaches away from the present invention by use of a high power pulse in other than a communication device.

Appellant also asserts that the Westrom reference does not contain any suggestion to combine its teachings with the teachings of the other cited references. The Examiner does not cite any passage that provides a suggestion to combine. Absent such a suggestion, the Westrom reference can not be used in combination with the other references. Moreover, it would not be inherently obvious to one of ordinary skill in the art to extract the teachings of Westrom in the combination suggested by the Examiner. Simply, there is nothing in the Westrom reference that would lead an inventor to combine the cited references.

The Examiner also improperly relies on the Amrany reference. The Examiner relies on the Amrany reference at page 6, first paragraph of the Final Office Action by stating it would be obvious to "modify the invention of Liggett to include using an existing modem for carrying out the time domain reflectometry method, as taught by Amrany, . . . " Thus the basis for the rejection is improper because the method of time domain reflectometry taught by Amrany is substantially different from that claimed. Simply, Amrany teaches use of a pulse and not a sequence signals as claimed (See Column 6, lines 40-45.). An impulse function or a step function is a pulse. The pulse may be repeated but this is still a repetitive pulse and does not qualify as a sequence signal. The Amrany reference is simply another reference that teaches a well known prior art path. Furthermore, and more importantly, the Examiner's rejection is improper because the Amrany reference does not teach correlation processing by use of a sequence signal as claimed.

In summary, none of the references cited by the Examiner contain any suggestion to combine the teaching of each reference into the claimed invention. The Examiner also committed error by failing to consider the declaration.

2. Second Claim Association

Appellant asserts that Claims 26-27, 65, 66, 67, 69 and 70 (Association 2) stand or fall independent of the other claims in this group. These claims are separately patentable because this association of claims contains the limitation of processing the time difference between transmission of the sequence signal and a point of correlation and the limitation of multiplying this time difference by a rate of propagation. These features cause these claims to be separately patentable because these additional limitations create patentably distinct methods or systems. The addition and unique steps, features, elements, or processes create separately patentably claims.

The Examiner's Assertions

These claims were rejected by the Examiner on the same basis as the claims in Claim Association 1. As such, the Examiner's assertions contained above are repeated here. These assertions are not duplicated as such duplication would only increase the page length and increase the complexity of this Appeal Brief.

In addition to the assertions contained above, the Examiner also asserts that with respect to claim 26, it is considered inherent that the input test signal of Liggett has some type of auto-correlation property because, as shown by the definition of auto-correlation, any signal that can

be integrated has some auto-correlation property. Also, while the invention of Liggett doesn't specifically mention detecting the presence of impedance mismatches, it is considered well-known in the art that the bridge taps disclosed by Liggett are actually impedance mismatches (see U.S. Patent Application Publication No. 2002/0114383-A1 to Belge et al., 0073 and 0076).

In addition, the Examiner also asserts that with regard to Claim 27, since the invention of Westrom and Liggett teaches determining a time difference between the start of the signal, corresponding to the point where the time interface causes a near-end echo, and a subsequent peak, the invention also teaches determining a time difference between the receipt of the near-end echo and a subsequent peak.

The Appellant's Assertion and Argument

Appellants assert that these claims are allowable for the same reasons as were presented above in connection with Claim Association 1. As such, the Appellants assertions contained above are hereby incorporated into this section. These assertions are not however, duplicated as such duplication would only increase the page length and increase the complexity of this Appeal Brief.

In addition to the assertions contained above, the Appellants submit that Claims 26, 27, 65, 67, 69 and 70 are allowable for additional reasons.

Claim 26 and 27

The Examiner also asserts that it is inherent that the input test signal of Liggett has some type of auto-correlation properties because, as shown by the definition of auto-correlation, any

signal that can be integrated has some auto-correlation properties. (Office Action at page 4, 1st paragraph) The Examiner also asserts that any signal that can be integrated has some auto-correlation properties (Office Action at page 27).

Both of these statements are provided without any support other than a definition of auto-correlation. More troubling, these statements are simply wrong. Not all signals have auto-correlation properties and a signal's ability to be integrated is not related to its correlation properties. (See also, the discussion for Claim Group 5.) As a result, this rejection is based on an improper technical assertion and as such the Liggett reference simply can not contain the asserted teaching. Thus, this rejection is improper and Claim 26 is allowable. Claim 27, which depends from Claim 26 is also allowable.

Appellant clearly specifies in the cited claims that the signal must be a sequence signal or have auto-correlation properties, yet the Examiner has effectively written this claim limitation out of the claim. This is improper and for at least this reason the rejection should not stand.

Claims 65, 66, 67, 69, and 70

Claims 65, 66, 67, 69, and 70 are allowable for the reasons stated above in connection with Claim Association 1. Namely, the cited references do not contain any suggestion to combine. In addition, and as cited above in detail, the cited references teach away from the claimed invention by suggesting use of a high power pulse or that complex processing such as correlation is limited to systems not embodied in a communication device. Both of these teachings lead one of ordinary skill in the art down one of the prior art paths, and away from the invention as claimed.

These assertions are supported by the Declaration, which the Examiner has improperly ignored. Failure to consider a declaration is improper.

3. Third Claim Association

Appellant asserts that Claims 1-5, 40, 41, and 43 (Association 3) stand or fall independent of the other claims in this group. Claim 1 and Claim 40 are independent claims. As can be seen from a review of these two independent claims, these claims contain numerous limitations that are not contained in the claims in the first claim association (Claims 7, 8, 11-12, 60-62 and 64) or the second claim association (Claims 26-27, 65-67, 69-70).

For example, the claim limitations found in Claim 1 of "generating a maximal length sequence signal utilizing a modem" and "retrieving a template signal; aligning the template signal and the correlated signal to determine a point of alignment; subtracting the template signal from the correlated signal to remove near-end echo from the correlated signal;" are features that cause Claim 1 to be separately patentable from the other claims. Neither the other claims nor the prior art teach these features. It would not be obvious to include these features in the systems defined by the other claims or the prior art.

The claim limitations found in Claim 40 include that the "signal generator is configured as part of a digital subscriber line modem" and that the "processor that is also configured to perform processing to achieve communication using a digital subscriber line standard" is further configured to perform timing and calculating operations as part of the sequence signal time domain reflectometry. These features cause Claim 40 to be separately patentable from the other

claims. Neither the other claims nor the prior art teach these features. It would not be obvious to include these features in the systems defined by the other claims or the prior art.

For these reasons, the claims in this third claim association are separately patentable over the claims in the first claim association and the second claim association.

The Examiner's Assertions

These claims were rejected by the Examiner on the same basis as the claims in Claim Association 1 and Claim Association 2. As such, the Examiner's assertions contained above are repeated here. These assertions are not duplicated as such duplication would only increase the page length and increase the complexity of this Appeal Brief.

In addition to the assertions contained above, the Examiner also asserts that with respect to Claim 2, Liggett teaches correlating the generated sequence and the reflected sequence to generate a correlated signal for processing. Westrom teaches obtaining a template signal by sending actual pulses, consistent with actual implementation, to obtain the near-end signal created by the line interface. Therefore the combination of inventions of Liggett and Westrom would have provided a template signal as a correlated version of a reflection created by a line interface.

The Appellant's Assertion and Argument

Appellants assert that these claims are allowable for the same reasons as were presented above in connection with Claim Association 1 and Claim Association 2. As such, the Appellants assertions contained above are hereby incorporated into this section. These assertions are not

however, duplicated as such duplication would only increase the page length and increase the complexity of this Appeal Brief.

In addition to the assertions contained above, the Appellants submit that Claims 1-5, 40, 41, and 43 are allowable for the following reasons.

With regard to Claims 1-5, Claim 1 contains the limitation of having a modem generate a maximal length sequence signal. None of the references cited by the Examiner teach having a modem generate a maximal length sequence signal for time domain reflectometry. Absent such a teaching within at least one reference, the rejection is improper.

Claim 1 also contains the limitations of "retrieving a template signal; aligning the template signal and the correlated signal to determine a point of alignment; and subtracting the template signal from the correlated signal to remove near-end echo from the correlated signal;".

Appellant asserts and the Examiner admits that none of the references teach aligning the template signal and the correlated signal. Examiner only asserts that "it is considered inherent" that this step must be undertaken. Appellant asserts that it is not inherent and the Appellant's position is supported by the Declaration. This rejection by the Examiner is improper because the Examiner has not considered the declaration and provided no references that teach aligning the template signal. The Examiners naked assertion that it is inherent is insufficient to sustain the rejection.

Furthermore, the prior art passage cited by the Examiner in the most recent Office Action for teaching these claim elements is found in the Westrom reference at column 9, lines 9-21. This is the only passage cited by the Examiner for teaching these claim steps.

This passage however teaches something quite different from what is claimed. As stated above, Westrom is directed to a power line testing system that utilizes a high power pulse. As stated in the cited section at column 9, lines 9-21, this high power pulse may be longer than 3 to 10 mS it may mask a close reflection and that the high power pulse must be subtracted. This has nothing to do with near end echo, but instead deals with the problem of masking a close reflection with the high power pulse.

Thus, this passage does not and can not teach retrieval of a template signal, alignment of a template signal with a correlated signal and subtraction of the template signal from the correlated signal because this reference utilizes a high power pulse and not a sequence signal. Furthermore, the entire high power pulse is subtracted, not a retrieved template signal.

This is the exact problem with a long duration (3-10 mS) high power pulse, and the problem avoided by the claimed invention. Citation by a passage in the prior art that highlights the problems in the prior art does not make the claimed invention obvious when the invention overcomes these problems.

Further, the Westrom reference teaches use of a high power pulse. It is simply not possible for a reference teaching use of a high power pulse to teach the complex processing associated with Claim 1 because the signal is entirely different. This is pointed out in the Attorney remarks and the Declaration, yet the Examiner refuses to acknowledge these differences and presents no support to refute the Declaration.

Claims 2-5 depend from Claim 1 and are likewise allowable based on the allowability of Claim 1.

Claims 40-41 and 43

Claim 40 is directed to a DSL modem configured to perform sequence signal time domain reflectometry using existing modem systems. Appellant incorporates the assertions or arguments provided above, which also apply with regard to Claim 40. Appellant submits that the Office Action is unclear as to which references are being relied on in the rejection of Claim 40.

Appellant notes that both the Liggett reference and the Westrom reference are directed to other than communication systems. The only reference cited that is directed to a communication device is the Amrany reference. However, as cited above, the Amrany reference teaches use of pulses, such as an impulse function or a step function. (column 6, lines 40-45). The pulse may be sent repeated times. (column 8, lines 5-8, Figure 9A, step 920). This is in direct contrast to the system of Claim 40, which utilizes a sequence signal as claimed. Because the system utilizes one or more pulses, the system of the Amrany can not have the configuration of Claim 40.

Moreover, the Amrany reference contains no suggestion or motivation to combine modem based processing with the processing of Liggett or Westrom. In fact, at column 8, line 18-20, the Amrany reference admits that the step and impulse functions (i.e. pulses) are utilized to simplify further processing. Appellants submit that is an admission that these pulses are used to simplify processing, which would otherwise be too complex for a communication device.

Furthermore, at column 9, lines 1-8, it is clear that the Amrany reference is not performing correlation and locating a point of correlation to determine the location of the line anomaly, as is claimed. Appellant also asserts that the Examiner has ignored Appellant's

assertions that these passages would lead an inventor away from implementing complex correlation based sequence signal processing in a communication device.

Claims 41 and 43 depend from independent Claim 40 and hence are allowable by reason of the allowability of Claim 40.

Rejected Claim Group 2

In this Claim Group, the Examiner rejected Claim 10.

The Examiner's Assertions

The Examiner rejected Claim 10 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent Application Publication No. 2002/0114383-A1 to Belge et al.

The Appellant's Assertion and Argument

Claim 10 depends from Claim 7 above and is believed allowable based on the allowability of independent Claim 7. As such, Appellants hereby incorporate the arguments provided above in conjunction with Claim Group 1, Association 1, for Claim 7.

As supported by the Declaration, the Belge reference teaches a pulse type system as evidenced by paragraph 76, ("reflection which is observed as a pulse . . ."). This very same paragraph expressly teaches way from the claimed invention by admitting that "analyzing the time domain waveform of the echo signal becomes very complicated. For this reason, a model based approach can be used for the TDR estimations." This passage expressly admits that

because of the complexities of TDR processing, a model based approach must be relied upon. Hence, this reference re-enforces the statements by the inventors in the Declaration that one accepted and conventional school of thought is to perform less complex pulse type TDR in a communication device and that processing by a communication device is limited to non-correlation, non-sequence type processing due to the complexity of such processing. This interpretation is supported in evidence by the Declaration by the inventors, both of whom are of at least ordinary skill in the art. Appellant notes that it is un-likely that either the Examiner or the Appellants' attorney qualifies as one of ordinary skill in the art. Hence, statements of the Declaration must be given substantial weight.

Appellant further notes that the Examiner has cited no portion of the Belge reference that suggests or motivates one to combine its teaching with the other three cited references. Moreover no consideration was provided to the Declarations by the Examiner.

Rejected Claim Group 3

Claims 13 and 63

Claim 13 and Claim 63 fall into Claim Association 1, which is patentability distinct for the reasons provided above in the discussion of Claim Group 1.

The Examiner's Assertions

The Examiner rejected Claims 13 and 63 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,062,703 to Wong et al.

The Examiner asserts that Wong teaches a method and apparatus for measuring the length of, or distance to discontinuities in, an optical transmission medium using optical time domain reflectometry by generating a pulse and transmitting the pulse through the optical line until a discontinuity is encountered wherein a portion of the pulse is reflected back to the measurement system (column 1, lines 37-51). Wong also teaches that by combing the reflected signal with an amplitude ripple generated due to the rotation of the incident and reflected optical signals (column 9, lines 21-50) the result can then be used to mathematically remove undesirable reflection (i.e. artifacts) from the desired response by gating components of the ripple pattern generated as a result of the rotation (column 11, lines 1-6).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal, as taught by Wong, because, as suggested by Wong, the combination would have provided a method for removing undesired artifacts and computing the propagation delay, as well as provided a method for determining multiple events attributable to different discontinuities in the channel (column 2, lines 46-54 and column 3, lines 3-12).

The Appellant's Assertion and Argument

Claim 13 depends from Claim 12, which in turn depends from Claim 7. Appellant submits that Claim 13 is allowable for the same reasons as Claim 7. Appellants further submits that by the Examiner's own admission the Wong reference teaches use of pulse, which teaches away from the present invention by teaching away from use of a sequence signal. In addition,

the Wong reference teaches use of a test equipment to perform the test, not a communication device. Thus the Wong reference simply teaches one to follow the known prior art paths.

With regard to additional limitations added by Claim 13 and Claim 12, the passages cited by the Examiner in the Wong reference, in particular at column 9, lines 21-50 and column 11, lines 1-6, simply do not teach the claimed limitations. The cited passage at column 9, lines 21-50 concerns the reflection from the line anomaly and has absolutely nothing to do with correlation artifacts as claimed. Indeed, Wong does not deal with correlation of a reflection sequence signal. The passage at column 11, lines 1-6 does discusses removing unwanted reflections, but teaches a method different from the claimed invention. Appellant express their frustration to the Board in that in this rejection and numerous others it is clear that the cited reference does not teach the claimed invention yet the rejections are repeated.

Claim 63 depends from independent Claim 60 and is thus allowable for this reason. In addition, Claim 63 contains limitations similar to those found in Claim 13 and thus Appellant repeats the arguments provided above for Claim 13.

Claim Association 2

Claim 30

Claim 30 falls into Claim Association 2, which is patentability distinct for the reasons provided above in the discussion of Claim Group 1.

The Examiner's Assertions

The Examiner rejected Claim 30 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,062,703 to Wong et al.

The Examiner asserts that the Wong reference teaches a method and apparatus for measuring the length of, or distance to discontinuities in, an optical transmission medium using optical time domain reflectometry by generating a pulse and transmitting the pulse through the optical line until a discontinuity is encountered wherein a portion of the pulse is reflected back to the measurement system (column 1, lines 37-51). The Wong reference also teaches that by combining the reflected signal with an amplitude ripple generated due to the rotation of the incident and reflected optical signals (column 9, lines 21-50) the result can then be used to mathematically remove undesirable reflection (i.e. artifacts) from the desired response by gating components of the ripple pattern generated as a result of the rotation (column 11, lines 1-6).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal, as taught by Wong, because, as suggested by Wong, the combination would have provided a method for removing undesired artifacts and computing the propagation delay, as well as provided a method for determining multiple events attributable to different discontinuities in the channel (column 2, lines 46-54 and column 3, lines 3-12).

The Appellant's Assertion and Argument

Claim 30 depends from independent Claim 26 and is hence believed allowable since Claim 26 is allowable for the reasons provided above. The argument provided above in connection with Claim 26 as found in Claim Group 1 is hereby incorporated and repeated.

In addition, the limitations added by Claim 30 are similar to the limitations discussed above in connection with Claims 13 and 63. The arguments provided above in connection with Claim 13 and 63 are hereby incorporated and repeated for Claim 30.

Claim Association 3

Claim 6

Claim 6 falls into Claim Association 3, which is patentability distinct for the reasons provided above in the discussion of Claim Group 1.

The Examiner's Assertions

The Examiner rejected Claim 6 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,062,703 to Wong et al.

The Examine asserts that Wong teaches a method and apparatus for measuring the length of, or distance to discontinuities in, an optical transmission medium using optical time domain reflectometry by generating a pulse and transmitting the pulse through the optical line until a discontinuity is encountered wherein a portion of the pulse is reflected back to the measurement system (column 1, lines 37-51). Wong also teaches that by combing the reflected signal with an

amplitude ripple generated due to the rotation of the incident and reflected optical signals (column 9, lines 21-50) the result can then be used to mathematically remove undesirable reflection (i.e. artifacts) from the desired response by gating components of the ripple pattern generated as a result of the rotation (column 11, lines 1-6).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal, as taught by Wong, because, as suggested by Wong, the combination would have provided a method for removing undesired artifacts and computing the propagation delay, as well as provided a method for determining multiple events attributable to different discontinuities in the channel (column 2, lines 46-54 and column 3, lines 3-12).

The Appellant's Assertion and Argument

Claim 6 depends from independent Claim 1 and is hence believed allowable since Claim 1 is allowable for the reasons provided above. The argument provided above in connection with Claim 1 in Claim Group 1 is hereby incorporated and repeated.

In addition, the limitations added by Claim 6 are similar to the limitations discussed above in connection with Claims 13 and 63. The arguments provided above in connection with Claim 13 and 63 are hereby incorporated and repeated for Claim 6.

Rejected Claim Group 4

In this Claim Group, the Examiner rejected Claim 9.

The Examiner's Assertions

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 4,963,020 to Luthra et al.

The Examiner asserts that Liggett in combination with Amrany, Westrom, and Belge teaches all the features of the claimed invention except for determining the location of the line anomaly by processing coefficients of a prediction filter.

Luthra teaches a method for detecting splices in an optical fiber using a time domain reflectometer that transmits a light pulse into an optical fiber and receives a reflected signal, which is stored in a memory, (column 2, lines 8-15) and also passed to a linear prediction filter (column 2, lines 29-38) (i.e. a finite impulse response filter) (column 2, lines 55-57) that has weights corresponding to its coefficients (column 3, lines 50-54), which are used for determining a future signal to predict the splice (i.e. line anomaly) (column 2, line 67 to column 3, line 10). Luthra also teaches that the correlation filter is used to detect a splice by comparing the output of the correlation filter with a threshold (column 5, lines 19-26).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include determining the location of a line anomaly by processing coefficients of a prediction filter, as taught by Luthra, because, as suggested by Luthra, the combination would have removed decaying exponential portions of the reflected signal to provide only the desired information pertaining to line anomalies (column 2, lines 29-38).

The Appellant's Assertion and Argument

Claim 9 depends from independent Claim 7 and is hence believed allowable since Claim 7 is allowable for the reasons provided above. The argument provided above in connection with Claim 7 in the discussion of Claim Group 1 is hereby incorporated and repeated.

Appellants further notes that the portions of the Luthra reference cited by the Examiner deal with utilizing the error term of a prediction filter (column, 2, lines 35-39). However, the claim limitation of claim 9 teaches processing the coefficients of a prediction filter, not working from an error term, as taught by the Luthra reference. Thus, the Luthra reference does not teach the claimed limitations and can not be used as a reference against Claim 9.

Rejected Claim Group 5

In this Claim Group, the Examiner rejected Claim 9.

The Examiner's Assertions

The Examiner rejected Claims 21, 22, 25, 29 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom, and further in view of U.S. Patent No. 4,597,183 to Broding.

As noted above, the Examiner asserts Liggett in combination with Amrany and Westrom teaches many of the features of the claimed invention including calculating the distance to an impedance mismatch using a time interval and propagation rate, but does not teach multiplying a time interval from the start of reflection to the occurrence of a signal component, indicating a

fault, by one-half the rate of propagation of the reflection through the communication channel to determine the distance between one end of the communication channel and the impedance mismatch. The combination also doesn't teach specifying that the test signal have good autocorrelation properties.

Broding teaches a method and apparatus for measuring a length of a cable using time domain reflectometry by transmitting a pulse sequence, in the form of an autocorrelation function (i.e. has good autocorrelation properties), over the communication channel (column 10, lines 35-41) and, upon the detection of its reflection, calculating the length of the round trip of the signal through the cable by multiplying a time interval between the generation of the sequence and a signal component indicating the reflection by the velocity of propagation. Broding also teaches the equivalent method for determining only the length of the cable during the initial trip by multiplying a time interval between the generation of the sequence and the signal component indicating reflection, or equivalently the time interval between the signal component indicating reflection and the initial generation of the sequence, by one-half and the velocity of propagation (column 2, lines 48-61).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include multiplying a time interval from the start of reflection to the occurrence of a signal component, indicating a fault, by one-half the rate of propagation of the reflection through the communication channel to determine the distance between one end of the communication channel and the impedance mismatch, as taught by Broding, because Broding suggests an equivalent method for calculating the distance to a location down a cable using a method that will determine the exact distance to the point of

interest, which can then be used for immediate analysis, rather than determining the round trip distance to and from the point of interest (column 2, lines 48-61).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the test signal have good autocorrelation properties, as taught by Broding, because, as suggested by Broding, the combination would have allowed lower frequencies to be used in the generation signal and therefore provided less cable attenuation (column 10, lines 35-41).

The Examiner further argues that similar to his position regarding the inclusion of the Westrom reference, the Examiner maintains that the invention of Broding is concerned with the problem of time-domain reflectometry and is only included to teach processing details that would be applicable in the invention of Liggett.

As stated in the previous Office Action, the invention of Broding teaches specifying that the input signal has good auto-correlation properties and the invention of Liggett includes a cross-correlating means. Further, as shown by the definition of auto-correlation, any signal that can be integrated has some auto-correlation properties.

The Appellant's Assertion and Argument

Claim 21 is an independent claim and Claims 22 and 25 depend from Claim 21. Claim 29 depends from Claim 26.

The Declaration by inventors Keith Jones and William Jones refutes the use of the Broding reference. Broding is directed to a method and apparatus for determining the length of a logging cable introduced into a bore hole, i.e., well hole. This reference is in no way related to

TDR on a high speed communication channel. Appellant doubts that an engineer in the data communication field would look to well drilling technology to obtain technical insight. As supported by the Declaration, when those of skill in the art of high speed communication systems look to art, they do not look to references directed to either logging cable or oil or gas wells (see column 1, lines 5-17). Hence, use of the reference is improper.

In addition, Examiner has committed error by failing to consider the Declaration. Manual of Patent Examining Procedure § 2144.08. In re Beattie, 974 F.2d 1309, 1313, 24 USPQ2d 1040, 1042-1043 (Fed. Cir. 1992) (error to not consider declarations).

Even if the Broading reference is considered, it would clearly teach an inventor down an prior art path by teaching use of a pulse or chirp. (column 10, lines 23-40). The discussion within the Broading reference to "autocorrelation function" is technically different. At column 10, lines 35-38 of Broading, it teaches that "an autocorrelation function can be derived" however the invention of Claim 26 requires performing correlation on the reflection signal to create a correlated signal.

Technically, these are significant differences that the Examiner has refused to accept. The Examiner's decision to simply find references that contain similar words and string them into obviousness rejections is improper.

None of the cited references, alone or in combination, teach a method performed by a communication device configured to process a reflected sequence signal using correlation processing to determine the location of one or more line anomalies on a communication channel. Further, there is not a suggestion to combine these references, nor has the Examiner provided a citation within the references to a suggestion or motivation to combine these references.

Finally, Claim 26 requires the sequence signal to have cross-correlation properties. Appellant submits that these features are not taught or suggested by the cited art, and hence Claim 26 is allowable.

Claim 29 is allowable for the same reasons as provide above in connection with Claim 26. In addition, Claim 26 and Claim 29 are allowable because of the limitation of autocorrelation properties. The Examiner states that the definition of auto-correlation (citing from Eric Weisstein's World of Mathematics), means that any signal that can be integrated has some auto-correlation properties. Mathematically this is an incorrect statement. Indeed, in the very prior art citation provided by the Examiner, it clearly states that the autocorrelation function is as follows:

$$R_f(t) = \lim_{T \longrightarrow \infty} \int_{-T}^{T} f(\tau) f(t+\tau) d\tau$$

Thus, only the limited set of sequence signal that meet this specific mathematically requirement have auto-correlation properties. To argue that all signals meet this requirement is simply mathematically incorrect. As a result, the prior art cited by the Examiner does not teach what is proposed and the rejected claims in the Claim Group are allowable.

Rejected Claim Group 6

In this Claim Group, the Examiner rejected Claim 23.

The Examiner's Assertions

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom and Broding, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

As noted above, Liggett in combination with Amrany, Westrom, and Broding teaches many of the features of the claimed invention including generating a maximum length sequence with a plurality of taps, but does not specify that the cross-correlation be performed using a sliding tapped delay line.

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Westrom, and Broding to include specifying that the cross-correlation be performed using a sliding tapped delay line, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the cross-correlation (column 3, lines 49-53) and, by using a sliding correlator, allowed the processing of a wider variety of pulses received by including very short pulses (column 1, lines 36-43).

The Appellant's Assertion and Argument

Claim 23, which depends from Claim 21 is allowable for the same reasons as Claim 21 is allowable. The argument provided above in connection with Claim 21 is hereby incorporated and repeated for Claim 23.

Rejected Claim Group 7

In this Claim Group, the Examiner rejected Claim 24.

The Examiner's Assertions

The Examiner rejected Claim 24 under 35 U.S.C. 103(a) as being unpatentable over the five (5) references of Liggett in view of Amrany, Westrom, and Broding and further in view of Wong et al.

The Examiner asserts that Liggett in combination with Amrany, Westrom, and Broding teaches all of the features of the claimed invention except for adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal.

Wong teaches a method and apparatus for measuring the length of, or distance to discontinuities in, all optical transmission medium using optical time domain reflectometry by generating a pulse and transmitting the pulse through the optical line until a discontinuity is encountered wherein a portion of the pulse is reflected back to the measurement system (column 1, lines 37-51). Wong also teaches that by combing the reflected signal with an amplitude ripple generated due to the rotation of the incident and reflected optical signals (column 9, lines 21-50) the result can then be used to mathematically remove undesirable reflection (i.e. artifacts) from the desired response by gating components of the ripple pattern generated as the result of the rotation (column 11, lines 1-6).

It would have been obvious to one have ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, and Broding to include adding a rotated reflection signal to the

correlated signal to reduce or remove artifacts on the correlated signal, as taught by Wong, because, as suggested by Wong, the combination would have provided a method for removing undesired artifacts and computing the propagation delay, as well as provided a method for determining multiple events attributable to different discontinuities in the channel (column 2, lines 46-54 and column 3, lines 3-12).

The Appellant's Assertion and Argument

Claim 24, which depends from Claim 21 is allowable for the same reasons as Claim 21 is allowable and for the same reasons as provided in the discussion of Claim Group 5. Thus, the argument provided above in connection with Claim 21 and Claim Group 5 is hereby incorporated and repeated for Claim 24.

Rejected Claim Group 8

In this Claim Group, the Examiner rejected Claim 28.

The Examiner's Assertions

The Examiner rejected Claim 28 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 4,041,381 to Hwa.

As noted above, the invention Liggett, Amrany, and Westrom teaches all the features of the claimed invention except for specifying that the method be performed by an integrated circuit.

Hwa teaches method and equipment for testing reflection points of transmission lines by transmitting a digital word from a maximal length sequence generator (column 2, lines 1-5) over a cable communication channel and receiving a reflection signal to indicate the occurrence of an impedance mismatch (column 1, lines 6-12). Hwa also teaches implementing the method using circuitry located on an integrated circuit (column 6, lines 40-49).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the method be performed by an integrated circuit, as taught by Hwa, because as suggested by Hwa the combination would have provided a device that could be manufactured cheaply and compactly so as to be used in a plurality of digital equipment (column 6, lines 40-49).

The Appellant's Assertion and Argument

Claim 28, which depends from Claim 26 is allowable for the same reasons as Claim 26 is allowable. Thus, the argument provided above in connection with Claim 26 is hereby incorporated and repeated for Claim 28.

Rejected Claim Group 9

In this Claim Group, the Examiner rejected Claims 42 and 44.

The Examiner's Assertions

Claims 42 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westom, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

As noted above, the Examiner asserts that Liggett in combination with Amrany and Westrom teaches many of the features of the claimed invention including generating a maximum length sequence with a plurality of taps, but does not specify that the cross-correlation be performed using a sliding tapped delay line or that the sequence generator or correlator comprise a tapped delay line.

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the cross-correlation be performed using a sliding tapped delay line and that the sequence generator and correlator comprise a tapped delay line, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the cross-correlation (column 3, lines 49-52) and, by using a sliding correlator, allowed the processing of a wider variety of pulses received by including very short pulses (column 1, lines 36-43).

Although Harmuth doesn't specifically disclose that the sequence generator comprises a tapped delay line, since Liggett discloses taps in the sequence generated and Harmuth teaches that the input line be a tapped delay line to provide more accurate cross-correlation, it would have been obvious to one having ordinary skill in the art to include these aspects in the sequence generator conform with the line connecting the remaining components.

The Appellant's Assertion and Argument

Claims 42 and 44 depend from Claim 40. Appellant submits that Claim 40 is allowable for the reasons provided above in connection with the discussion of Claim Group 1 and hence Claims 42 and 44 are also allowable.

In addition, Harmuth is directed to a system for receiving radar signals and as such is not properly combined with the other references because one of ordinary skill in the art of channel analysis for communication systems would not look to radar technology as described in Harmuth. Furthermore, the Examiner admits that:

> *Although Harmuth doesn't specifically disclose that the sequence generator comprises a tapped delay line, since Liggett discloses taps in the sequence generated and Harmuth teaches that the input line be a tapped delay line to provide more accurate cross-correlation, it would have been obvious to one having ordinary skill in the art to include these aspects in the sequence generator conform with the line connecting the remaining components.*

Thus, the Examiner admits that none of the references expressly teaches the claimed system with a sequence generator comprising a tapped delay line. Further, the Examiner provides no support for his assertion that it would be obvious to utilize this element of a DSL (digital subscriber line modem) as claimed, except for the Examiner's own unsupported assertion of obviousness. Appellant notes that the Examiner's assertion that Liggett discloses "taps in the

sequence generated" does not make sense as a sequence does not have "taps". Thus, Appellant submits that Claims 42 and 44 are allowable.

Rejected Claim Group 10

In this Claim Group, the Examiner rejected Claim 45, 46, 48 and 49.

The Examiner's Assertions

The Examiner rejected Claims 45, 46, 48 and 49 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,075,628 to Fisher et al.

As noted above, Liggett in combination with Amrany and Westrom teaches all the features of the claimed invention except for including a scrambler in the sequence generator.

Fisher teaches a method for determining fault locations in communication systems using time domain reflectometry (column 1, lines 4-6) wherein the sequence generator includes a data scrambler (column 2, lines 64-65) and a controller for controlling an optical transmitter sending the sequence (column 2, lines 37-40 and Figure 1).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include a scrambler in the sequence generator, as taught by Fisher, because, as suggested by Fisher, the combination would have scrambled the data such that the downstream transmitted data sequence has statistical properties equivalent to those of a continuous random binary sequence and therefore allowed the data itself to be used in the correlation process (column 2, line 64 to column 3, line 4).

The Appellant's Assertion and Argument

Claim 45 is an independent claim and Claims 46, 48, and 49 depend from Claim 45. Appellant asserts that Claim 46, 48, and 49 are allowable based on the allowability of Claim 45.

With regard to Claim 45, Appellants repeat the arguments provided above in connection with Claim Group 1. In addition, Appellants submit Liggett in combination with Amrany and Westrom do not teach all the features of the claimed invention, and these references do not contain a suggestion to combine. In addition, one or ordinary skill in the art would not look to the Westrom reference and hence the Examiner improperly utilized the Westrom reference. The Examiner also improperly ignored the declaration.

With regard to the Fisher reference, Appellant argues that this reference, at a minimum does not disclose the claimed limitations, and even teaches away from the claimed invention. For example, the first limitation of Claim 45 requires "a scrambler configured to generate a sequence signal." However, Fisher at column 2, lines 64-67 teaches that the scrambler simply 'scrambles' the data and hence does create the data. Thus the claimed invention eliminates apparatus by utilizing the scrambler to generate the sequence signal whereas Fisher requires data from a data source. Hence, the Fisher reference does not teach the first element of Claim 45.

Furthermore, the Fisher reference does not teach generation of a sequence signal by the scrambler, but instead teaches that the actual data, that is being transmitted across the channel, be used for the line probe signal. (column 3, lines 1-4). As cited in the Fisher reference, this has numerous problems (column 4, lines 56-63) and these problems do not plague the system of the Claim 45.

Moreover, the scrambled data of Fisher is simply a continuous random binary sequence which is not a sequence signal as claimed in Claim 45 and the correlation occurring in Fisher is not correlation as is occurring in Claim 45. This is not the claimed sequence signal because as a continuous random binary sequence cannot be correlated with itself to yield a point of correlation because it is random.

Rejected Claim Group 11

In this Claim Group, the Examiner rejected Claim 47.

The Examiner's Assertions

The Examiner rejected Claim 47 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, and Fisher and further in view of U.S. Patent No. 6,417,672 to Chong.

As noted above, Liggett in combination with Amrany, Westrom, and Fisher teaches all the features of the claimed invention except for specifying that the peak voltage of the sequence signal be less than 18 volts.

Chong teaches a method for detecting a bridge tap using frequency domain analysis through time-domain reflectometry to determine an impedance mismatch (column 4, lines 11-20) wherein a test set provides an input signal have a voltage of 20 volts peak-to-peak (i.e. a peak voltage of 10 volts) (column 11, lines 1-14).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, and Fisher to include specifying that the peak voltage of the

sequence signal be less than 18 volts, as taught by Chong, because the invention of Liggett, Amrany, Westrom, and Fisher teaches using a relatively low voltage to reduce the probability of cross-talk and, while Liggett and Westrom are silent on this voltage, Chong provides a voltage that would meet this requirement. It also would have been obvious to one having ordinary skill in the art to apply any voltage that is small enough to meet this cross-talk elimination since the applicant fails to provide criticality to the selection of 18 volts.

The Appellant's Assertion and Argument

Claim 47 depends from Claim 45 and as such Appellant submits that Claim 47 is allowable based on the allowability of Claim 45. Appellant hereby repeats the arguments submitted above in connection the Claim Group 10.

Rejected Claim Group 12

In this Claim Group, the Examiner rejected Claim 50, 51, and 53.

The Examiner's Assertions

The Examiner rejected Claims 50, 51, and 53 under 35 U.S.C. 103(a) as being unpatentable over the five (5) way rejection of Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,144,250 to Little and U.S. Patent No. 5,523,758 to Harmuth.

As noted above, the invention of Liggett, Amrany, and Westrom teaches many of the features of the claimed invention including obtaining a time between the start of the correlation signal and a subsequent peak caused by the echo from a line anomaly but does not teach a

corresponding device for measuring this time, specifically a timer that comprises a counter configured to count the samples between the start of the signal and a subsequent peak. This combination also doesn't specifically disclose that the cross-correlation be performed using a sliding tapped delay line in the correlator during communication.

Little teaches a power amplifier time domain reflectometer, and corresponding method, comprising generating a modulated RF signal (column 2, lines 35-36), which is conducted on an output line to a plurality of system components which are to be tested for an impedance failure, and a bi-directional coupler that detects the waveform of the output RF signal and the waveform of the reflect RF signal caused by an impedance fault (column 1, lines 55-60). Little also teaches that the beginning of the output signal waveform is used to trigger a timing device which continues timing until the beginning of the reflected signal waveform is detected (column 1, line 60 to column 4) wherein the time device comprises a counter that counts sample pulses between the start of the signal and a subsequent peak caused by the echo from the impedance failure (column 2, line 52 to column 2, line 12).

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include a timer that comprises a counter configured to count the samples between the start of the signal and a subsequent peak, as taught by Little, because the combination would have provided a timing device needed in the invention of Liggett,

Amrany, and Westrom and, as suggested by Little, provided a simplified method for performing time domain reflectometry in the Gigahertz frequency range (column1, lines 45-47).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the cross-correlation be performed using a sliding tapped delay line in the correlator during communication, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the cross-correlation (column 3, lines 49-52) and, by using a sliding correlator, allowed the processing of a wide variety of pulses received by including very short pulses (column 1, lines 36-43).

The Appellant's Assertion and Argument

Claim 50 is an independent claim and Claims 51 and 53 depend from Claim 50. Claims 51 and 53 are argued to be allowable based on the allowability of Claim 50.

Appellants repeat and hereby incorporate the arguments provided above in connection with Claim 21 (Claim Group 5) and Claim 26 and Claim 65 (Claim Group 1) in support of the allowance of Claim 50.

Liggett is directed, as clearly shown in Figures 3 and 4, to a stand alone piece of test equipment. Moreover, no suggestion is made within the Liggett reference to implement the disclosed system into a communication device. As offered in the Declaration, the Liggett reference teaches away from the present invention by teaching complex multi-processor based sequence signal TDR in a stand alone piece of test equipment. This path is a known line of

conventional and accepted wisdom in the prior art. The Examiner also committed error by refusing to consider the Declaration.

Rejected Claim Group 13

In this Claim Group, the Examiner rejected Claim 52.

The Examiner's Assertions

The Examiner rejected Claim 52 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,122,652 to Jin et al.

The Examiner asserts that Liggett in combination with Amrany, Westrom, Little, and Harmuth teaches many of the features of the claimed invention including correlating a generated signal with a reflected signal and determining the position of detected peaks of the reflected waveform using a pulse detecting counter, but does not teach specifying that the peak detector comprises a comparator and a register for storing a current peak value.

Jin teaches a method for detecting a tone or any other periodical signal in a telephone system (column 1, lines 5-6) by segmenting the data signal into fixed length data samples, counting, with a counter, the data samples to prepare a data window therefrom, a peak value detector to monitor the data samples and to detect a sample having a peak value with the data window (column 2, lines 22-29), and a correlation unit (column 2, lines 48-49) wherein the peak detector comprises a comparator and memory (i.e. register) holding a current peak value (column

6, lines 29-33 and 39-46) and the correlation unit functions using a comparator and a counter (column 8, lines 18-34).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, Little, and Harmuth to include specifying that the peak detector comprises a comparator and a register for storing a current peak value, as taught by Jin because, as suggest by Jin, the combination would have insured that any calculations made using a received peak voltage would be made with respect to the correct value by resetting the detector with the current value after a predetermined count (column 4, lines 63-65 and column 6, lines 46-47) and allow for the determination of whether the correlated value lies within a desired range (column 9, lines 30-39), as would be needed to discriminate between the correlated result of the received pulses, correlated with the generated sequence, and the correlated result of any extraneous noise pulses, correlated with the generated sequence, in the invention of Liggett, Amrany, Westrom, and Harmuth.

The Appellant's Assertion and Argument

Claim 52 depends from independent Claim 50 and is hence believed allowable since Claim 50 is allowable for the reasons provided above and thus overcomes the questionable 5 way rejection assembled by the Examiner. The argument provided above in connection with Claim 50 in Claim Group 12 is hereby incorporated and repeated.

In addition, the limitations added by Claims 50 and 52 are similar to the limitations discussed above in connection with Claims 21, 26, and 65. Hence, the arguments provided above in connection with these claims are hereby incorporated and repeated for Claim 52.

Rejected Claim Group 14

In this Claim Group, the Examiner rejected Claim 54.

The Examiner's Assertions

The Examiner rejected Claim 54 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,292,539 to Eichen et al.

The Examiner asserts that, Liggett in combination with Amrany, Westrom, Little, and Harmuth teaches all the features of the claimed invention except for specifying that the sequence signal does not generate disruptive cross-talk in adjacent pairs in a binder that also contained the twisted pair conductor.

Eichen teaches a method and apparatus for digital subscriber loop qualification including a digital subscriber loop with a structure including bridge taps, load coils, and a binder group (i.e. a group of twisted pairs bundled together) (column 2, lines 3-9).

Since the invention of Liggett, Amrany, Westrom, Little, and Harmuth teaches minimizing the voltage of the sequence signal to lower the possibility of cross-talk occurring across various twisted pairs (Liggett, column 5, lines 9-12) and Eichen teaches that a group of twisted pairs bundled together makes up a binder group, it would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, Little, and Harmuth to including lowering the voltage of the sequence signal to further reduce the possibility

of cross-talk between adjacent twisted pairs in a binder because the combination would have prevented unwanted interference in a plurality of DSL environments.

The Appellant's Assertion and Argument

Claim 54 depends from independent Claim 50 and is hence believed allowable since Claim 50 is allowable for the reasons provided above and thus overcomes the questionable 6 way rejection assembled by the Examiner. The argument provided above in connection with Claim 50 in Claim Group 12 is hereby incorporated and repeated.

In addition, the limitations added by Claims 50 and 54 are similar to the limitations discussed above in connection with Claims 21, 26, and 65. Hence, the arguments provided above in connection with these claims are hereby incorporated and repeated for Claim 54.

Rejected Claim Group 15

In this Claim Group, the Examiner rejected Claim 68.

The Examiner's Assertions

The Examiner rejected Claim 68 under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,122,652 to Jin et al.

The Examiner asserts that Liggett in combination with Amrany, Westrom teaches many of the features of the claimed invention including correlating a generated signal with a reflected

signal and determining the position of detected peaks of the reflected waveform, but does not teach specifying that the correlation processing comprises a compare routine and a counter.

Jin teaches a method for detecting a tone or any other periodical signal in a telephone system (column 1, lines 5-6) by segmenting the data signal into fixed length data samples, counting, with a counter, the data samples to prepare a data window therefrom, a peak value detector to monitor the data samples and to detect a sample having a peak value with the data window (column 2, lines 22-29), and a correlation unit (column 2, lines 48-49) wherein the peak detector comprises a comparator and memory (i.e. register) holding a current peak value (column 6, lines 29-33 and 39-46) and the correlation unit functions using a comparator and a counter (column 8, lines 18-34).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westom to include specifying correlation processing comprises a compare routine and a counter, as taught by Jin, because, as suggested by Jin, the combination would have secured that any calculations made using a received peak voltage would be made with respect to the correct value by resetting the detector with the current value after a predetermined count (column 4, lines 63-65 and column 6, lines 46-47) and allow for the determination of whether the correlated value lies within a desire range (column 9, lines 30-39), as would be needed to discriminate between the correlated result of the received pulses, correlated with the generated sequence, and the correlated result of any extraneous noise pulses, correlated with the generated sequence, in the invention of Liggett, Amrany, and Westrom.

The Appellant's Assertion and Argument

Claim 68 depends from independent Claim 65 and is hence believed allowable since Claim 65 is allowable for the reasons provided above in connection with Claim Group 1. The argument provided above in connection with Claim 65 in Claim Group 1 is hereby incorporated and repeated.

In addition, the limitations added by Claims 65 and 68 are similar to the limitations discussed above in connection with Claims 21, 26 and 50. Hence, the arguments provided above in connection with these claims are hereby incorporated and repeated for Claim 68.

IX. CLAIM APPENDIX

The Appendix is attached at the end of the Brief.

CLOSING

Appellant requests allowance of all the pending claims for the reasons provided above.

Respectfully submitted,

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